UNITED STATES PATENT AND TRADEMARK OFFICE

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ART UNIT	PAPER NUMBER
2167	

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Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/726,338	ZAMAN ET AL.
	Examiner	Art Unit	
	Michael D. Pham	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>22 September 2006</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 3-26, 31 are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-26 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

Detailed Action

Drawings

1.   Prior objection to element 510 is respectfully withdrawn.

2.   Prior objection to element 1115 is respectfully withdrawn.

Claim Objections

3.   Prior objections to claim 1, 3, 19, and 21 have been respectfully withdrawn.

4.   Prior objection to claim 31 is respectfully withdrawn.

Claim Rejections - 35 USC § 112

5.   Prior rejection under 35 U.S.C. 112 second paragraph to claim 31 is respectfully

withdrawn.

Claim Rejections - 35 USC § 102

6.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section
122(b), by another filed in the United States before the invention by the applicant for
patent or (2) a patent granted on an application for patent by another filed in the United
States before the invention by the applicant for patent, except that an international
application filed under the treaty defined in section 351(a) shall have the effects for
purposes of this subsection of an application filed in the United States only if the
international application designated the United States and was published under Article
21(2) of such treaty in the English language.

7.   Claims 3, 6-7, 8, 10, 15, 17-18, 19-22 are rejected under 35 U.S.C. 102(e) as being

anticipated by U.S. Patent application publication 2004/0236767 with provisional filing date of

5/7/2003 by Soylemez et. al. (hereafter Soylemez).

<u>Claim 3:</u>

As to claim 3, Solyemez discloses, "**a method in a computing system for processing a**

relational database query" comprising:

> "**Receiving the relational database query, the received relational database query**
>
> **being drawn against a relational model of a multidimensional data source**" as
>
> [[0018] Techniques are provided for efficiently accessing multidimensional data (drawn
>
> against relational model of a multidimensional data source) using relational database
>
> statements (relational query), such as SQL commands.]**,**
>
> **wherein**
>
> "**the relational model comprises a relational-to-multidimensional mapping between**
>
> **a virtual relational table and the multidimensional data source**" as [0074, the virtual
>
> return table that is populated by the table function, which describes the shape of the result
>
> of the table function e.g. essentially a mapping of source multidimensional data objects to
>
> target rows and columns in the virtual return table.]**;**
>
>
> "**Using the relational-to-multidimensional mapping together with**
>
> **relational/multidimensional equivalency logic to construct a multidimensional**
>
> **database query based on the received relational database query**" as [0077, The table

function does not completely govern what is returned to the relational database server for

complete execution of the query. Hence, relational database server may be requesting

data for an application without knowing what data types and in what format the actual

returned values will be. Therefore, the multidimensional database server dynamically

creates abstract data type definitions (equivalency logic) if necessary to define the data

values contained in the virtual return table which were not defined and specified in the

table function.]

", wherein the relational/multidimensional equivalency logic comprises a general

mapping between relational queries and structures and multidimensional queries

and structures" as [0078,The abstract data type definitions are dynamically created as

part of the process of fetching and organizing the multidimensional data that is requested

in the query based on the nature of the data returned in response to the query. The

abstract data type definitions are returned to the relational database server so that the

server can understand and work with the data that is presented in the virtual return table.];

and

"Submitting the constructed multidimensional database query for execution against

the modeled multidimensional data source" as [0018, The relational database server

communicates with the multidimensional database server to cause the multidimensional

database server to extract the multidimensional data required by the relational database

server to process the relational database statement].

Claim 6:

The method of claim 3 wherein the relational query specifies a detail filter against the relational model, and wherein the constructed multidimensional query specifies that the detail filter be applied to the modeled multidimensional data source [0049].

Claim 7:

The method of claim 6 wherein the relational query is expressed in SQL, and wherein the detail filter specified by the relational query is an SQL WHERE clause [0054].

Claim 8:

The method of claim 3 wherein the relational query specifies an aggregation function against the relational model, and wherein the constructed multidimensional query specifies that the aggregation function be applied to the modeled multidimensional data source [0006, aggregate functions. 0052 multidimensional database server may determine which cells in the subset satisfy any cell-filtering criteria specified by the query.].

Claim 10:

The method of claim 3 wherein the relational query specifies a summary filter against the relational model, and wherein the constructed multidimensional query specifies a summary filter be applied to the modeled multidimensional data source [[0054] In one embodiment, at block 218 a subset of cells (e.g., a sub-cube) is identified, from the data subset, having cells that

satisfy dimension-based cell-filtering criteria specified in the query. For example, based on

information in the table function parameters (e.g., a LIMIT statement) or in a SQL WHERE

clause, particular cells within the subset that are of interest to the query are identified based on

dimension-based criteria. Thus, even though a subset of the n-dimensional objects has already

been identified based on the table function, other portions of the database query might further

limit the particular cells of interest within the subset].

Claim 15:

The method of claim 3, further comprising:

> **Receiving, in response to submitting the multidimensional database query, a**
>
> **multidimensional database query result** [0018, The relational database server
>
> communicates with the multidimensional database server to cause the multidimensional
>
> database server to extract the multidimensional data required by the relational database
>
> server to process the relational database statement]; and

Using a relational-to-multidimensional mapping contained by the model together with

relational/multidimensional equivalency logic to construct a relational database query

result based on the received multidimensional database query result. a relational query

result construction subsystem that uses a relational-to-multidimensional mapping

contained by the model to construct a relational database query result based on the

received multidimensional database query result [0018, The relational database server

communicates with the multidimensional database server to cause the multidimensional database

server to extract the multidimensional data required by the relational database server to process

the relational database statement. 0074, an abstract table type (schema) can be defined in the

relational database server to describe the virtual return table that is populated by the table

function, which describes the "shape" of the result of the table function, e.g., essentially a

mapping of source multidimensional data objects to target "rows" (e.g., abstract object types) and

"columns" (e.g., attributes of the abstract object types) in the virtual return table (e.g., abstract

table type as a collection of abstract object types).].

Claim 17:

The method of claim 3, further comprising making information about the model available

for use in building the received relational database query [0018].

Claim 18:

The method of claim 3, further comprising:

Determining that the received relational database query is drawn against both the

relational model of the multidimensional data source and one or more native relational

tables [0018, accessing multidimensional data using relational database statements, such as

SQL commands. To access the data a relational database statement is submitted to a

relational database server. The relational database server communicates with the

multidimensional database server to cause the multidimensional database server to extract the

multidimensional data required by the relational database server to process the statement.];

and

Constructing a native relational database query based on aspects of the received

relational database query drawn against conventional relational tables [[0020] the

multidimensional database server places the extracted multidimensional data in a relational

structure, referred to herein as the "virtual return table", to enable the relational database

server to access and manipulate the data as if the data resided in a relational table.]; and

Submitting the native relational database query for execution against the

conventional relational tables [0018, relational database query is made. 0020, relational

database query is sent to virtual table],

And wherein the constructed multidimensional database query is based on aspects of

the received relational database query drawn against the relational model of the

multidimensional data source [[0020] the multidimensional database server places the

extracted multidimensional data in a relational structure, referred to herein as the "virtual

return table", to enable the relational database server to access and manipulate the data as if

the data resided in a relational table.].

Claim 19:

As **to claim 19, Soylemez discloses** "a computer-readable medium comprising instructions to

cause a computing system to process a relational database query", **said instructions**

comprising:

A first set of instructions, executable on a processor, configured to recieve

Receiving the relational database query, the received relational database query

being drawn against a relational model of a multidimensional data source [[0018]

Techniques are provided for efficiently accessing multidimensional data (drawn against

relational model of a multidimensional data source) using relational database statements

(relational query), such as SQL commands.]**, wherein**

The relational model comprises a relational-to-multidimensional mapping between a

virtual relational table and the multidimensional data source[0074, the virtual return

table that is populated by the table function, which describes the shape of the result of the

table function e.g. essentially a mapping of source multidimensional data objects to target

rows and columns in the virtual return table (mapping between a virtual relational table

and the multidimensional data source).];

A second set of instructions, executable on the processor, configured to use the

relational-to-multidimensional mapping to translate the received relational database

query into a multidimensional database query [[0045] At block 204, a subset of data

is identified based on the query. For example, the multidimensional database server 106

(FIG. 1) identifies source data, i.e., a subset of data from the n-dimensional data cube

(e.g., n-dimensional analytical workspace data objects), based on a table function. 0077,

a table function might have parameters that specify mapping of source multidimensional

data to a target virtual return table. 0078,The abstract data type definitions are

dynamically created as part of the process of fetching and organizing the

multidimensional data that is requested in the query based on the nature of the data

returned in response to the query. The abstract data type definitions are returned to the relational database server so that the server can understand and work with the data that is presented in the virtual return table.]; and

a third set of instructions, executable on the processor, configured to submit

    the multidimensional database query for execution against the modeled

    multidimensional data source [0018, The relational database server communicates with

    the multidimensional database server to cause the multidimensional database server to

    extract the multidimensional data required by the relational database server to process the

    relational database statement].

Claim 20:

The computer-readable medium of claim 19 further comprising:

A fourth set of instructions, executable on the processor, configured to

    Receive, in response to submitting the multidimensional database query, a

    multidimensional database query result [0018, The relational database server

    communicates with the multidimensional database server to cause the multidimensional

    database server to extract the multidimensional data required by the relational database

    server to process the relational database statement]; and

A fifth set of instructions, executable on the processor, configured to

> **Use a relational-to-multidimensional mapping to translate the received**
>
> **multidimensional database query result into a relational database query result**
>
> [0018, The relational database server communicates with the multidimensional database
>
> server to cause the multidimensional database server to extract the multidimensional data
>
> required by the relational database server to process the relational database statement.
>
> 0074, an abstract table type (schema) can be defined in the relational database server to
>
> describe the virtual return table that is populated by the table function, which describes
>
> the "shape" of the result of the table function, e.g., essentially a mapping of source
>
> multidimensional data objects to target "rows" (e.g., abstract object types) and "columns"
>
> (e.g., attributes of the abstract object types) in the virtual return table (e.g., abstract table
>
> type as a collection of abstract object types).].

Claim 21:

As to claim 21, a computing system for processing a relational database query, comprising;

> A query reception subsystem that receives the relational database query, the
>
> received relational database query being drawn against a relational model of a
>
> multidimensional data source [[0018] Techniques are provided for efficiently accessing
>
> multidimensional data using relational database statements, such as SQL commands.],
>
> **wherein**
>
> > **The relational model comprises a relational-to-multidimensional mapping**
> >
> > **between a virtual relational table and the multidimensional data source** as [0074, the

virtual return table that is populated by the table function, which describes the shape of

the result of the table function e.g. essentially a mapping of source multidimensional data

objects to target rows and columns in the virtual return table (mapping between a virtual

relational table and the multidimensional data source).];

A multidimensional query construction subsystem that uses the relational-to-

multidimensional mapping to construct a multidimensional database query based

on the received relational database query [[0020] According to one aspect of the

invention, the multidimensional database server places the extracted multidimensional

data in a relational structure, referred to herein as the "virtual return table", to enable the

relational database server to access and manipulate the data as if the data resided in a

relational table. [0045] At block 204, a subset of data is identified based on the query.

For example, the multidimensional database server 106 (FIG. 1) identifies source data,

i.e., a subset of data from the n-dimensional data cube (e.g., n-dimensional analytical

workspace data objects), based on a table function. The table function may operate with

one or more input parameters that specify (1) the name of the analytic workspace in

which the source data (also referred to as data objects and data items) is stored; (2) the

name of a virtual relational table that has been defined to organize the multidimensional

data in tabular form; and (3) a mapping of the source data objects to target columns in the

table]; and

A query submission subsystem that submits the constructed multidimensional

database query for execution against the modeled multidimensional data source

[0018, The relational database server communicates with the multidimensional database

server to cause the multidimensional database server to extract the multidimensional data

required by the relational database server to process the relational database statement].

Claim 22:

The computing system of claim of claim 21, further comprising:

a query result reception subsystem that receives, in response to submitting the

multidimensional database query, a multidimensional database query result [0018, The

relational database server communicates with the multidimensional database server to cause the

multidimensional database server to extract the multidimensional data required by the relational

database server to process the relational database statement]; and

a relational query result construction subsystem that uses a relational-to-

multidimensional mapping contained by the model to construct a relational database query

result based on the received multidimensional database query result [0018, The relational

database server communicates with the multidimensional database server to cause the

multidimensional database server to extract the multidimensional data required by the relational

database server to process the relational database statement. 0074, an abstract table type

(schema) can be defined in the relational database server to describe the virtual return table that

is populated by the table function, which describes the "shape" of the result of the table function,

e.g., essentially a mapping of source multidimensional data objects to target "rows" (e.g., abstract

object types) and "columns" (e.g., attributes of the abstract object types) in the virtual return

table (e.g., abstract table type as a collection of abstract object types).].

Claim Rejections - 35 USC § 103

8. ⠀⠀The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject
> matter sought to be patented and the prior art are such that the subject matter as a whole
> would have been obvious at the time the invention was made to a person having ordinary
> skill in the art to which said subject matter pertains. Patentability shall not be negatived
> by the manner in which the invention was made.

9. ⠀⠀*Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent*

application publication 2004/0236767 with provisional filing date of 5/7/2003 (hereafter

Soylemez) as applied to claim ⠀·3, 6-7, 8, 10, 15, 17-18, 19-22 above, and further in view of

U.S. Patent Application Publication 20020124002 by Su et. al. (hereafter Su).

Claim 4:

The method of claim 3 wherein the multidimensional query is constructed in MDX.

⠀⠀Soylemez does not explicitly disclose wherein the multidimensional query is constructed in

⠀⠀MDX. However, Su discloses the use of MDX on a multidimensional data source [0086,

⠀⠀0121]. Both inventions are directed to database systems. It would have been obvious to one

⠀⠀of ordinary skill in the art to modified Solyemez to have included the step of wherein the

⠀⠀multidimensional query is constructed in MDX. A skilled artisan would have been motivated

⠀⠀to do so for the purpose of being able to talk to the multidimensional data source in a

language it would understand. It is further well known in the art that MDX is a standard

multidimensional database query language.

Claim 5:

The method of claim 4 wherein the relational query is expressed in SQL [0018].

10.   *Claims 12-13, 16, 23-26 and 31 are rejected under 35 U.S.C. 103(a) as being*

unpatentable over U.S. Patent application publication 2004/0236767 with provisional filing

date of 5/7/2003 by Soylemez (hereafter Soylemez) as applied to claim 3, 6-7, 8, 10, 15, 17-18,

19-22 and further in view of U.S. Patent Application Publication 20020087516 by Cras et. al.

(hereafter Cras).

Claim 12:

The method of the claim 3 **wherein the relational query specifies a detail filter against the**

relational model having selected predicates [0062], and

>   However, Solyemez does not explicitly disclose wherein the constructed

>   multidimensional query specifies, for each of the selected predicates that can be applied

>   against the modeled multidimensional data source before a crossjoin operation is

>   performed, applying the selected predicate against the modeled multidimensional data

>   source as early as possible. On the other hand, Cras discloses, [0019] a Relational

>   Database Management System (RDBMS) having any arbitrary structure is translated into

>   a multi-dimensional data model suitable for performing OLAP operations upon. If a

relational table defining the relational model includes any tables with cardinality of 1,1 or 0,1, the tables are merged into a single table according to the present invention. Both inventions are in the same field of endeavor. That is, database systems and in particular multidimensional databases. It would have been obvious to one of ordinary skill in the art to have modified Soylemez to have included **wherein the constructed multidimensional query specifies, for each of the selected predicates that can be applied against the modeled multidimensional data source before a crossjoin operation is performed, applying the selected predicate against the modeled multidimensional data source as early as possible** based on the disclosure of Cras. A skilled artisan would have been motivated to do so for the purpose of obtaining data from a multidimensional data structure and combining it with a relational structure.

Claim 13:

The method of claim 3 wherein **the relational query specifies a detail filter against the relational model having selected predicates** [0062]. However Solyemez does not explicitly disclose wherein the constructed multidimensional query specifies, for each of the selected predicates that can be applied against the modeled multidimensional data source before a crossjoin operation is performed, applying the selected predicate against the modeled multidimensional data source before a crossjoin operation is performed. On the other hand, Cras discloses, [0019] a Relational Database Management System (RDBMS) having any arbitrary structure is translated into a multi-dimensional data model suitable for performing OLAP operations upon. If a relational table defining the relational model includes any tables with

cardinality of 1,1 or 0,1, the tables are merged into a single table according to the present

invention. Both inventions are in the same field of endeavor. That is, database systems and in

particular multidimensional databases. It would have been obvious to one of ordinary skill in the

art to have modified Soylemez to have included **wherein the constructed multidimensional**

query specifies, for each of the selected predicates that can be applied against the modeled

multidimensional data source before a crossjoin operation is performed, applying the

selected predicate against the modeled multidimensional data source before a crossjoin

operation is performed based on the disclosure of Cras. A skilled artisan would have been

motivated to do so for the purpose of obtaining data from a multidimensional data structure and

combining it with a relational structure.

Claim 16:

The method of claim 3, further comprising:

> **Determining that the received relational database query is drawn against both the**
>
> **relational model of the multidimensional data source and one or more native**
>
> **relational tables**[0018, accessing multidimensional data using relational database
>
> statements, such as SQL commands. To access the data a relational database statement is
>
> submitted to a relational database server. The relational database server communicates
>
> with the multidimensional database server to cause the multidimensional database server
>
> to extract the multidimensional data required by the relational database server to process
>
> the statement.]; and

Constructing a native relational database query based on aspects of the received relational database query drawn against conventional relational tables [[0020] the multidimensional database server places the extracted multidimensional data in a relational structure, referred to herein as the "virtual return table", to enable the relational database server to access and manipulate the data as if the data resided in a relational table.]; and

Submitting the native relational database query for execution against the conventional relational tables[0018, relational database query is made. 0020, relational database query is sent to virtual table]; and

And wherein the constructed multidimensional database query is based on aspects of the received relational database query drawn against the relational model of the multidimensional data source, the method further comprising:

Receiving, in response to submitting the native relational database query, a native relational database query result[[0020] the multidimensional database server places the extracted multidimensional data in a relational structure, referred to herein as the "virtual return table", to enable the relational database server to access and manipulate the data as if the data resided in a relational table.].

However Soylemez does not explicitly disclose **combining the constructed relational database query result with the received native relational database query result in accordance with the received relational database query.**

On the other hand, Cras discloses, [0019] a Relational Database Management System (RDBMS) having any arbitrary structure is translated into a multi-dimensional data model suitable for performing OLAP operations upon. If a relational table defining the relational model includes any tables with cardinality of 1,1 or 0,1, the tables are merged into a single table according to the present invention. Both inventions are in the same field of endeavor. That is, database systems and in particular multidimensional databases. It would have been obvious to one of ordinary skill in the art to have modified Soylemez to have included the steps combining contents of a first search result produced in response to the native relational database query and a second search result produced in response to the multidimensional database query into a third search result responsive to the received relational database query based on the disclosure of Cras. A skilled artisan would have been motivated to do so for the purpose of obtaining data from a multidimensional data structure and combining it with a relational structure.

Claim 23:

As to claim 23, Soylemez discloses "**one or more computer memories collectively containing a data source modeling data structure for use in modeling a multidimensional data source in a relational database environment**", the data structure comprising:

"**a schema for one or more virtual relational tables each representing contents of the multidimensional data source**" as [0074, specifies a particular "form" in which multidimensional data from the multidimensional schema (schema) is to be presented to the relational server according to the table function. 0030, During processing of a relational statement, relational database server 108 can request and receive a set of multidimensional data, such as virtual return table 107 (virtual relational table), from multidimensional database server 106 for further processing according to one or more SQL statements]; and

"**one or more mappings between schema components and contents of the multidimensional data source to which they correspond**" as [0074, an abstract table type (schema) can be defined in the relational database server to describe the virtual return table that is populated by the table function, which describes the "shape" of the result of the table function, e.g., essentially a mapping (mapping) of source multidimensional data objects (multidimensional data source) to target "rows" (e.g., abstract object types) and "columns" (e.g., attributes of the abstract object types) in the virtual return table (e.g., abstract table type as a collection of abstract object types).],

"**wherein the schemas contained by the data structure are configured to be used to formulate relational queries against the virtual relational tables**" as [0031, Such data and metadata may be stored in database 104 logically, for example, according to relational schema constructs (schema contained by data structure). 0077, a table

function might have parameters that specify a mapping of source multidimensional data to a target virtual return table. However the table function does not completely govern what is returned to the relational database server for complete execution of the query (relational queries against the virtual relational tables). The multidimensional database server dynamically creates abstract data type definitions if necessary to define the data values contained in the virtual return table (configures definitions for abstract data types). 0043, The result set from the table function is a virtual return table containing columns that can be joined to relational tables or views, or to other virtual return tables populated by another table function.].

"the schemas and mappings <u>are configured to</u> be used to translate relational queries against the virtual relational tables into multidimensional queries against the multidimensional data source and to translate multidimensional query results from the multidimensional data source into relational query results from the virtual relational tables" as [0020] the multidimensional database server places the extracted multidimensional data in a relational structure, referred to herein as the "virtual return table", to enable the relational database server to access and manipulate the data as if the data resided in a relational table. See also figure 1. That is, the system translates multidimensional query results from the multidimensional data source into relational query results from the virtual relational tables, but not translate relational queries against the virtual relational tables into multidimensional queries against the multidimensional data source.

Solyemez does not explicitly disclose **"to translate relational queries against the virtual relational tables into multidimensional queries against the multidimensional data source."** Cras discloses relational database systems having an arbitrary structure is translated into a mulit-dimensional data model suitable for performing OLAP operations upon. In doing so, a normalization is performed and a relationship between the original table and the normalized table (i.e. a virtual) is created. 0020, Olap measures are derived from the normalized relational table by an automated method. Both Solyemez and Cras are directed to mapping relational database systems to multidimensional database systems. It would have been obvious to one of ordinary skill in the art to have modified Solyemez to have included "to translate relational queries against the virtual relational tables into multidimensional queries against the multidimensional data sources" based on the disclosure of Cras. One of ordinary skill in the art would have been motivated to do so for the purpose of maintaining multidimensional table consistency.

Claim 24:

The computer memories of claim 23 wherein, in the multidimensional data source, a particular multidimensional level name occurs in both a first hierarchy of the multidimensional data source and a second hierarchy of the multidimensional data source that is distinct from the first hierarchy [[0047] In one embodiment, the table function has another input parameter that specifies a command, such as an OLAP DML (Data Manipulation Language) command, that may be used, for example, to limit one or more dimensions to a particular level of the dimension's hierarchical structure],

and wherein the schema for the virtual relational tables specify both a first column

corresponding to the occurrence of the multidimensional level name in the first hierarchy

and a second column corresponding to the occurrence of the multidimensional level name

in the second hierarchy, the metadata for the first column specifying an external name

that is the same as the multidimensional level name as well as an internal name, and the

metadata for the second column specifying an external name that is the same as the

multidimensional level name and an internal name that is distinct from the internal name

specified for the first column [[0045] At block 204, a subset of data is identified based on the

query. For example, the multidimensional database server 106 (FIG. 1) identifies source data,

i.e., a subset of data from the n-dimensional data cube (e.g., n-dimensional analytical workspace

data objects), based on a table function. The table function may operate with one or more input

parameters that specify (1) the name of the analytic workspace in which the source data (also

referred to as data objects and data items) is stored; (2) the name of a virtual relational table that

has been defined to organize the multidimensional data in tabular form; and (3) a mapping of

the source data objects to target columns in the table. Therefore, from these parameters the

multidimensional database server identifies a subset of the multidimensional data, i.e., a subset

of the n-dimensional data objects, prior to fetching the source data from the analytic workspace.

For example, the subset may be identified based on the specification of dimension a, dimension

b, and dimension c in the limit map].

Claim 25:

The computer memories of claim 23 wherein the data structure further comprises, for each of a plurality of members of the multidimensional data source, metadata identifying an aggregation rule applied to the measure in a multidimensional database environment in which the modeled multidimensional data source resides [[0031] data and metadata may be stored in database 104 logically, for example, according to relational schema constructs, multidimensional schema constructs, or a combination of relational and multidimensional schema constructs. Database 104 comprises a multidimensional schema for storing data for one or more multidimensional cubes 110, an abstract data construct that represents multidimensional data. As mentioned, data that is organized by two or more dimensions is referred to as multidimensional data].

Claim 26:

As to claim 26, Solyemez discloses **"One or more computer memories collectively containing a database-type transparency data structure for use in modeling a plurality of multidimensional data source in relational database environment"**, the data structure comprising:

for each of the multidimensional data sources, individual source information comprising:

"information defining one or more corresponding virtual relational tables" [0074, specifies a particular "form" in which multidimensional data from the multidimensional schema (schema) is to be presented to the relational server according to the table function. 0030, During processing of a relational statement, relational database server 108 can request and

receive a set of multidimensional data, such as virtual return table 107 (virtual relational table),

from multidimensional database server 106 for further processing according to one or more SQL

statements], and

"**information mapping between components of the virtual relational tables**

and contents of the multidimensional data source" [0074, the virtual return table that is

populated by the table function, which describes the shape of the result of the table function e.g.

essentially a mapping of source multidimensional data objects to target rows and columns in the

virtual return table (mapping between a virtual relational table and the multidimensional data

source).]; and

Solyemez does not explicitly disclose "**a single body of relational/multidimensional**

equivalency logic that is configured to be used to translate a relational query against one or

more of the virtual relational tables defined by the individual source information for

selected multidimensional data sources into a multidimensional query against the selected

multidimensional data sources with reference to the individual source information for the

selected multidimensional data sources." Cras discloses relational database systems having an

arbitrary structure is translated into a mulit-dimensional data model suitable for performing

OLAP operations upon. In doing so, a normalization is performed and a relationship between

the original table and the normalized table (i.e. a virtual) is created. 0020, Olap measures are

derived from the normalized relational table by an automated method. Both Solyemez and Cras

are directed to mapping relational database systems to multidimensional database systems. It

would have been obvious to one of ordinary skill in the art to have modified Solyemez to have

included "to translate relational queries against the virtual relational tables into multidimensional queries against the multidimensional data sources" based on the disclosure of Cras. One of ordinary skill in the art would have been motivated to do so for the purpose of maintaining multidimensional table consistency.

Claim 31:

Solyemez discloses "a method in a computing system for processing a relational database query", comprising:

> **"Receiving the relational database query, the received relational database query being drawn against both a relational model of a multidimensional data source and a native relational table"** as [0018, relational database statements. 0030 relational database server can directly access and operate on data in table 112 and can access and operate on data stored in multidimensional database server.]

> **"submitting the native relational database query against the native relational table"** [0030, During the processing of a relational statement, relational database server can request and receive a set of multidimensional data, such as virtual return table, from multidimensional database server];

"**submitting the multidimensional database query against the multidimensional data

source**" as [0028, Multidimensional database server is able to interpret the

multidimensional data which, in one embodiement, is stored as one or more LOBs or

BLOBs in database table (muiltidimensional data).]; and

"**Converting the received relational database query into (1) a native relational

database query against only the native relational table, and (2) a multidimensional

database query against the multidimensional data source**" as [0030, relational

database server comprises a SQL processor that parses, interprets (converts), and

manages execution of data queries and/or operations embodied in SQL statements.

During the processing of a relational statement the relational server may directly access

and operate on data in table 112 (native table). 0028, Multidimensional database server is

able to interpret the multidimensional data which, in one embodiement, is stored as one

or more LOBs or BLOBs in database table (muiltidimensional data)]

Solyemez discloses querying against a relational database (0030) (i.e. can be a first

search). Solyemez discloses against querying against a multidimensional data 0028 (i.e.

can be a second search). However, Solyemez does not explicitly disclose "**combining

contents of a first search result produced in response to the native relational

database query and a second search result produced in response to the

multidimensional database query into a third search result responsive to the**

received relational database query". Cras discloses 0296, the first time you perform a

search on all matches the find folder is added at the end of the edit panel. The pattern

used to perform the research is an item added under the find folder with the find icon.

Hence, Cras suggests combining search results. Both Solyemez and Cras are directed to

multidimensional database systems. Not only that, but also, multidimensional database

systems in combination with relational database systems. One of ordinary skill in the art

at the time the invention was made would have been motivated to combine Solyemez and

Cras in order to provide a more efficient search results by broadening the amount of data

returned from a query.

II. *Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent*

application publication 2004/0236767 with provisional filing date of 5/7/2003 by Soylemez

(hereafter Soylemez) as applied to claims 3, 6-7, 8, 10, 15, 17-18, 19-22 above, and further in

view of U.S. Patent application publication 2005/0004904 with provisional filing date of

5/7/2003 by Keamey (hereafter Keamey).

Claim 14:

The method of claim 3 wherein the relational query specifies performing a selected aggregation

function on a selected column of a virtual relational table, the virtual relational table

corresponding to a multidimensional data source, the selected column corresponding to a

selected measure of the multidimensional data source, the method further comprising:

Soylemez does not explicitly disclose retrieving metadata identifying an aggregation

function used for the selected measure of the multidimensional data source;

However, Keamey discloses **retrieving identifying aggregation functions used for the**

selected measure of the multidimensional cube [abstract, specifies operations

according to criteria. 0054 discloses operations are aggregate functions.]. Both

inventions are directed towards the same field of endeavor. That is database systems, and

in particular multidimensional database systems. It would have been obvious to one of

ordinary skill in the art to have modified Soylemez to have included the step of

retrieving identifying aggregation functions used for the selected measure of the

multidimensional cube based on the disclosure of Keamey. A skilled artisan would

have been motivated to for the purpose of describing the correct operation to enact.

Determining whether the aggregation function identified by the metadata matches

the selected aggregation function [Keamey, Abstract, para. 30-31, matches specified

criteria to determine requested operation.]; and

If the aggregation function identified by the metadata matches the selected

aggregation function, generating a multidimensional query against the

multidimensional data source that relies on the aggregation function performed in

the multidimensional data source that relies on the aggregation function performed

in the multidimensional data source [Keamey, abstract, performs requested operation.].

12, *Claims 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.*

Patent application publication 2004/0236767 with provisional filing date of 5/7/2003 by

Soylemez (hereafter Soylemez) as applied to claims 3, 6-7, 8, 10, 15, 17-18, 19-22 above, and

further in view of "Database Systems: The complete book" by Hector Garcia-Molina

(hereafter Garcia-Molina).

Claim 9:

As to claim 9, Soylemez discloses the method of claim 8 **wherein the relational query is**

expressed in SQL [0018]; and further discloses, 0052, determining cell filtering based on

Query, wherein cell values are associated with types of data on which a function is executed,

such as a summation, average, minimum value, maximum value, and the like [0006] (i.e.

aggregation function specified by relational query). However Soylemez does not explicitly

(this is an obvious function in SQL) disclose wherein the aggregation function specified by the

relational query **is an SQL GROUP BY clause.**

On the other hand, Garcia-Molina discloses that SQL supports grouping, by using a GROUP BY

clause [pages 277, 282]. Both references are in the same field of endeavor, databases.

Furthermore, both disclose relational databases that utilize SQL. It would have been obvious to

have modified Solyemez to have included an SQL GROUP BY clause based on the disclosure of

Gracia-Molina. A skilled artisan would have been motivated to do so for the purpose of

grouping tuples together. One of ordinary skill in the art would know this would be a form of

filtering.

Claim 11:

The method of claim 10 wherein the relational query is expressed in SQL [0018], and

wherein the summary filter specified by the relational query[[0054] In one embodiment, at

block 218 a subset of cells (e.g., a sub-cube) is identified, from the data subset, having cells that

satisfy dimension-based cell-filtering criteria specified in the query. For example, based on

information in the table function parameters (e.g., a LIMIT statement) or in a SQL WHERE

clause, particular cells within the subset that are of interest to the query are identified based on

dimension-based criteria. Thus, even though a subset of the n-dimensional objects has already

been identified based on the table function, other portions of the database query might further

limit the particular cells of interest within the subset]. However, Soylemez does not explicitly

disclose is **an SQL HAVING clause.**

On the other hand, Garcia-Molina discloses that SQL supports grouping, by using a HAVING

clause, (pages 277, 282). Both references are in the same field of endeavor, databases.

Furthermore, both disclose relational databases that utilize SQL. It would have been obvious to

have modified Solyemez to have included an SQL HAVING clause based on the disclosure of

Gracia-Molina. A skilled artisan would have been motivated to do so for the purpose of

grouping tuples together. One of ordinary skill in the art would know this would be a form of

filtering.

Response to Arguments

13. As to Applicant's arguments with respect to claims 23 and 26 have been considered but are moot in view of the new ground(s) of rejection.

14. As to Applicant's arguments with respect to claims 3-22 and 24-25 filed 9/18/06 have been fully considered but they are not persuasive.

Applicant's assert for claim 3 that Soylemez does not disclose mapping a relational query to a multidimensional query to satisfy a received relational database query.

In response, the examiner respectfully disagrees. First, it is noted that there can be more than one virtual table (Solyemez, 0043). Further, in creating the virtual return table, the system maps the relational query to a multidimensional query to satisfy a received relational database query. 0074, Solyemez is clear on this by stating that the virtual return table that is populated by the table function, which describes the shape of the result of the table function e.g. essentially a mapping of a source multidimensional data objects to target rows and columns in the virtual return table. Therefore, Applicant's arguments with respect to claims 3, 19, and 21 are unpersuasive over the cited art.

As to claim 31, Applicant's assert that the step of converting is not shown, hindsight reasoning, no motivation was given, and that Cras relates to translating a relational database structure into a multidimensional data structure, rather than the claimed combining the contents of a search result in response to a native relational database query and a multidimensional

database query into a response to a relational database query, which would not itself be multidimensional by definition.

First in response to applicant's assertion towards the step of converting not being disclosed in claim 31. The examiner respectfully disagrees. As disclosed in Soylemez, 0030, the SQL processor parses, interprets, and manages execution of data queries and/or operations embodied in SQL statements. During the processing of a relational statement the relational server may directly access and operate on data in table 112 (native table). Simply put, the SQL processor must interpret (e.g. convert) the relational query in order to directly access and operate the table 112 (native relational database). Similarly, the SQL processor must interpret the relational query in order to obtain the multidimensional data presented in table 110.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on

combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, applicant attacks Cras alone, and not as a combination for the third limitation.

Regardless, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Solyemez discloses querying against a relational database (0030) (i.e. can be a first search). Solyemez discloses querying against a multidimensional data 0028 (i.e. can be a second search). However, Solyemez does not explicitly disclose **"combining contents of a first search result produced in response to the native relational database query and a second search result produced in response to the multidimensional database query into a third search result responsive to the received relational database query"**. Cras discloses 0296, the first time you perform a search on all matches the find folder is added at the end of the edit panel. The pattern used to perform the research is an item added under the find folder with the find icon. Hence, Cras suggests combining search results (i.e. combining a first and second to make a third search result). Both Solyemez and Cras are directed to multidimensional database systems. Not only that, but also, multidimensional database systems in combination with relational database systems. One of ordinary skill in the art at the time the invention was made

would have been motivated to combine Solyemez and Cras in order to provide a more efficient

search result by broadening the amount of data returned from a query thus utilizing not only the

relational database but also the multidimensional database.

The prior art used in rejecting claim 31 has not changed. Therefore, no new rejection was made.

Conclusion

15. The prior art made of record listed on PTO-892 and not relied, if any, upon is considered

pertinent to applicant's disclosure.

Applicant's amendment necessitated the new ground(s) of rejection presented in this

Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this

final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael D. Pham whose telephone number is (571)272-3924. The examiner can normally be reached on Monday - Friday 9am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on 571-272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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